



**Grazing Management for Water Quality Protection**  
 Livestock and Poultry Environmental Learning Center  
 Educational Webcast Series  
 October 16, 2009

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**Riparian Management: The Importance of Knowing Your Stream**  
 Tom Isenhart  
 Department of Natural Resource Ecology and Management

**Grazing Management of Beef Cows to Limit Non-point Source Pollution of Streams in Midwestern Pastures**  
 Jim Russell  
 Department of Animal Science

**Pathogens and Grazing Livestock**  
 Steve Ensley  
 Veterinary Diagnostic Laboratory

**Iowa State University**

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**Acknowledgements**

This project is supported in part by:

- The Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Award No. 2006-51130-03700
- The Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Award No. 2007-35102-18115
- The Leopold Center for Sustainable Agriculture
- Iowa Beef Center
- Rathbun Land and Water Alliance

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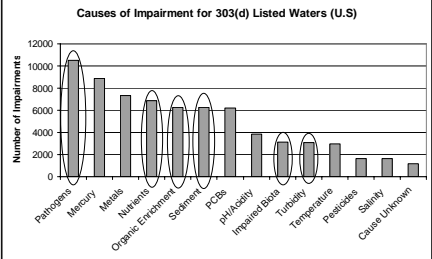
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**Why – Local Water Quality**

Causes of Impairment for 303(d) Listed Waters (U.S)



Cause of Impairment	Number of Impairments (Approximate)
Pathogens	11000
Mercury	10000
Metals	8000
Nutrients	7000
Organic Enrichment	6000
Sediment	6000
PCBs	6000
pH/Acidity	4000
Impaired Biota	3000
Turbidity	3000
Temperature	2000
Pesticides	1500
Salinity	1500
Cause Unknown	1000

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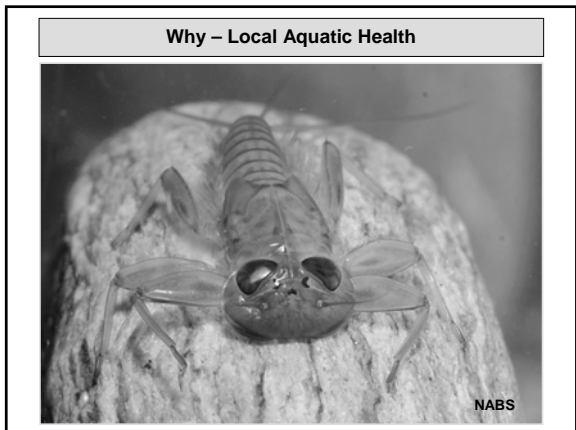
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### Impacts of Suspended and Bedded Sediments

1. Direct Effect on Aquatic Life
  - Visibility impairment (prey capture and avoidance, reproductive cues)
  - Physical abrasion
  - Clogging of filtration and respiratory organs
  - Smothering and entrapment
2. Indirect Effects on Physical Habitat
  - Decreased productivity
  - Elimination of interstitial spaces used for reproductive habitat, feeding, and cover
  - Limit oxygen transport
3. Effect on Uses Other Than Aquatic Life
  - Recreation
  - Drinking Water

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### Why – Downstream Nutrient Transport

#### Phosphorus Delivery to the Gulf of Mexico

**PHOSPHORUS**

**NITROGEN**

Yield (kg km<sup>-2</sup> yr<sup>-1</sup>)

- < 0.1
- 0.1 to 1
- 1 to 10
- 10 to 50
- 50 to 100
- > 100

[http://water.usgs.gov/nawqa/sparrow/gulf\\_findings/](http://water.usgs.gov/nawqa/sparrow/gulf_findings/)

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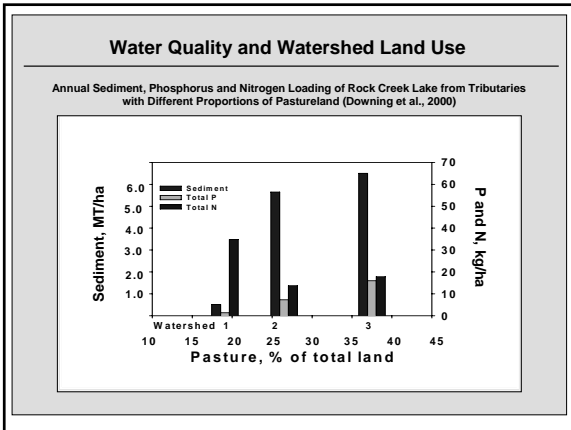
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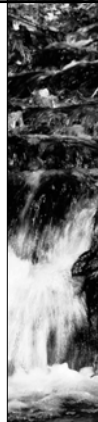
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#### Grazing Management for Water Quality Protection

- Quantify losses of sediment and phosphorus from stream banks in pastures grazed under different stocking systems
- Measure the spatial and temporal distribution patterns of location, defecation and urination of beef cattle managed in different stocking systems in pastures with upland and riparian zones.
- Demonstrate site-specific models of grazing management practices that optimize the quality of stream water and the profitability of beef cow-calf production in pastures.
- Assess the effects of grazing management on the risk of pathogen loading of pasture streams

**Iowa State University**

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#### The Importance of Stream Hydrology (Using Sediment Transport as an Example)

**Surface Runoff**




USDA-NRCS

**Cattle Access Points**




ISU-NREM

**Gully Erosion**



USDA-NRCS

**Stream Bank Erosion**



ISU-NREM

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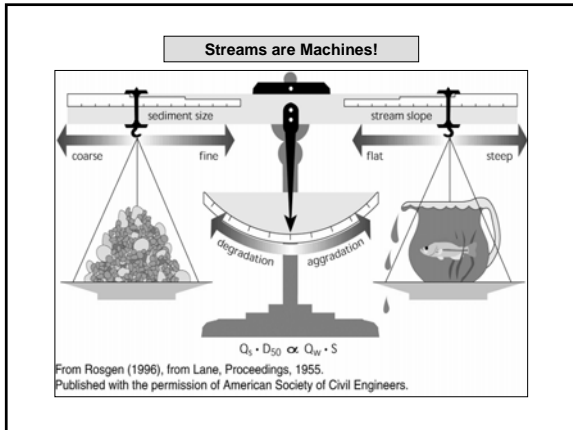
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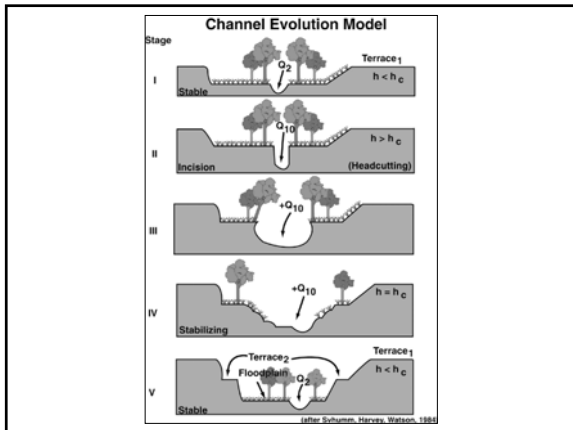
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**Sediment & nutrient loss from stream banks adjacent to crop fields, buffers & grazed pastures**

- Seven year study
- Three ecoregions (NE, SE, and Central IA)
- Erosion pin method
- Streambank bulk density and P


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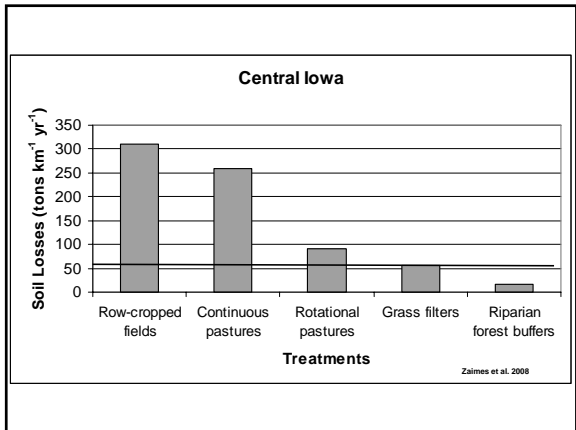
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**A Reminder That It Is Not That Simple!**

- Ongoing study being conducted in paired watersheds in Central IA
- Comparing streambank erosion rates among riparian land uses of pasture, grass (cool-season and warm season), and forest.
- Methods include erosion pins and radionuclides.


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Land use	Per Pin Recession Values cm (p value)				
	June 2005- Dec. 2006	Jan. 2007- May 2007	Single event	Two year total	Rate Per-year
Grass land	1.7	11.4	5.3	13.1	6.6
Pasture	0	9.7	6.1	9.7	4.9
Riparian forest	0	19.1 (0.001)	9.8 (0.01)	19.1	9.6

Palmer 2008

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**Lessons Learned**

1. Stream bed and bank erosion can impact local aquatic health and be a significant source of downstream sediment and nutrient transport
2. Stream disequilibrium and channel evolution stage will override local management
3. Riparian land use does impact stream bank erosion rates (under stable hydrology)

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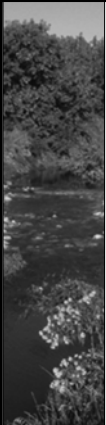
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**Management Options?**

1. Riparian landuse changes
  - Buffer width?
    - Narrow for small streams and local impacts – outside the meander belt for large rivers
2. Stream bank stabilization
3. Reduce stream power
  - Landscape practices?
  - Pool-riffle structures
  - Re-meander stream

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**Narrow Riparian Buffers**



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**Wider Riparian Buffers**



**Before Buffer Establishment**      **Five Years After Establishment**

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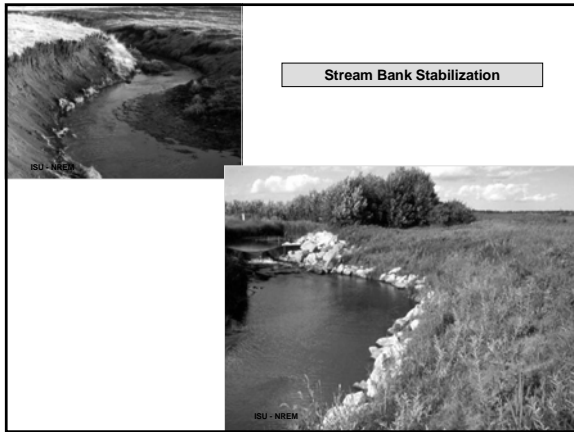
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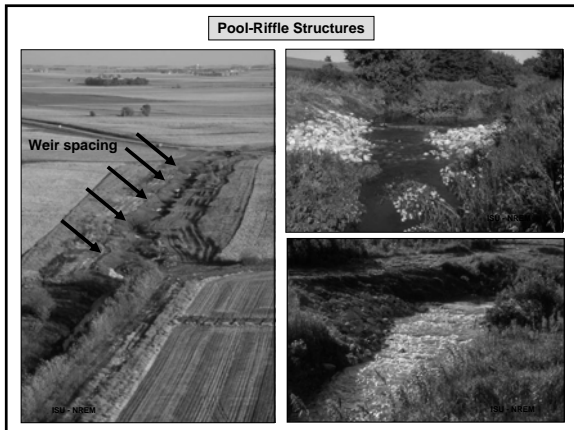
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